1. Find the domain of each of the following functions, and list in interval notation. **Use a number line to convert from inequalities to intervals, if necessary.**

\[ f(x) = \frac{5 + 2\sqrt{x + 4}}{x^2 - 1} \]

In this function we have two restrictions; the radicand of the square root in the numerator \((x + 4)\) must be non-negative, and the denominator of the fraction \((x^2 - 1)\) cannot be equal to zero.

\[ x + 4 \geq 0 \quad \text{AND} \quad x^2 - 1 \neq 0 \]
\[ x \geq -4 \quad \text{AND} \quad (x - 1)(x + 1) \neq 0 \]
\[ x \geq -4 \quad \text{AND} \quad x - 1 \neq 0 \quad \text{AND} \quad x + 1 \neq 0 \]
\[ x \geq -4 \quad \text{AND} \quad x \neq 1 \quad \text{AND} \quad x \neq -1 \]

The inequality \(x \geq -4\) indicates that only inputs that are greater than or equal to \(-4\) are allowed for the function \(f(x)\). However two inputs which are greater than or equal to \(-4\) are not allowed; 1 and \(-1\). So we must exclude those two inputs from the set of real numbers that are greater than or equal to \(-4\).
Taking our number and translating that to interval notation, we have the following:

\[ [-4, -1) \cup (-1, 1) \cup (1, \infty) \]